CLAIMS

WE CLAIM:

1. A method for sourcing semiconductor manufacturing defects, comprising the steps of:

extracting one or more parameters (extracted-parameters) from a semiconductor

5   manufacturing results file (results file), the results file indicating a set of defect-

coordinates;

matching the one or more extracted-parameters against one or more candidate

defect-signatures (candidate-signatures), the matching step identifying one or more

matching defect-signatures (matching-signatures) of the one or more candidate-signatures

10   as matching the one or more extracted-parameters, the one or more matching-signatures

indicating an associated one or more defect-sources; and

reporting the one or more defect-sources.

2. The method of Claim 1, wherein the extracted-parameters comprise an annular defects-

15   distribution, a radial defects-distribution or a zonal defects-distribution.

3. The method of Claim 2, a first vector representing the one or more extracted-

parameters, a second one or more vectors representing the one or more candidate-

signatures, a third one or more vectors representing the one or more matching-signatures,

20   wherein the matching step comprises using a k-nearest-neighbor algorithm to compute

the third one or more vectors, the third one or more vector representing a set of nearest-

neighbors of the first vector, the set of nearest-neighbors computed from among the

second one or more vectors, and wherein $k \geq 1$ and the k-nearest-neighbor algorithm uses a standard Euclidean distance function.

4. The method of Claim 3, wherein the candidate-signatures are stored in a
5 defect-signature bank.

5. The method of Claim 4, wherein the semiconductor manufacturing results file comprises a KLA results file or a FITS image file.

10 6. The method of Claim 5, wherein the reporting step comprises sending an alert using a fabrication plant notification system.

7. The method of Claim 1, further comprising the step of filtering the results file by defect size, defect classification, defect spectral frequency or defect intensity.

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8. A method for processing a semiconductor manufacturing results file (results file), comprising the steps of:

computing a set of k-nearest-neighbor distances (k-NN distances) for a set of defect-coordinates, the set of defect-coordinates indicated by the results file; and

20 classifying a frequency distribution of the set of k-NN distances as a positively-skewed distribution, a negatively-skewed distribution, a reverse-J distribution, a bimodal distribution, an annular distribution, a radial distribution, a uniform distribution, or a normal distribution.

9. The method of Claim 8, wherein the classifying step uses a set of one or more classification-tolerances as provided by a user.

10. The method of Claim 9, further comprising the step of storing the frequency distribution in a defect-signature bank.

11. A method for processing a semiconductor manufacturing results file (results file), comprising the steps of:

    determining a set of concentric wafer-rings of a wafer-map, the wafer-map given by the results file, the results file indicating a set of defect-coordinates associated with a set of wafer-defects falling within the wafer-map; and

    computing a set of defect-percentages, wherein a first defect-percentage of the set of defect-percentages is (a) associated with a first wafer-ring of the set of concentric wafer-rings and (b) represents a ratio of the number of wafer-defects falling within the first wafer-ring to the total number of wafer-defects falling within the wafer-map.

12. The method of Claim 11, further comprising the step of storing the set of defect-percentages in a defect-signature bank.

13. The method of Claim 12, further comprising the step of associating a weighting-factor with the set of defect-percentages and storing the weighting-factor in the defect-signature bank.

14. A method for processing a semiconductor manufacturing results file (results file), comprising the steps of:

    determining a first set of pie-slice shaped segments (wafer-slices) of a wafer-map,

5   the wafer-map given by the results file, the results file indicating a set of defect-coordinates associated with a set of wafer-defects falling within the wafer-map; and

    computing a first set of defect-percentages, wherein a first defect-percentage of the set of defect-percentages is (a) associated with a first wafer-slice of the first set of wafer-slices and (b) represents a ratio of the number of wafer-defects falling within the

10 first wafer-slice to the total number of wafer-defects falling within the wafer-map.

15. The method of Claim 14, further comprising the step of storing the first set of defect-percentages in a defect-signature bank.

15 16. The method of Claim 15, further comprising the step of associating a weighting-factor with the first set of defect-percentages and storing the weighting-factor in the defect-signature bank.

17. The method of Claim 14, further comprising wrapping the first set of defect-

20 percentages to obtain a second set of defect-percentages corresponding to a second set of wafer-slices, the second set of wafer-slices corresponding to a rotated version of the first set of wafer-slices.

18. A method for processing a semiconductor manufacturing results file (results file), comprising the steps of:

determining a first set of horizontal wafer-strips (horizontal-strips) of a wafer-map, the wafer-map given by the results file, the results file indicating a set of defect-coordinates associated with a set of wafer-defects falling within the wafer-map; and

computing a first set of horizontal-defect-percentages, wherein a first horizontal-defect-percentage of the first set of horizontal-defect-percentages is (a) associated with a first horizontal-strip of the first set of horizontal-strips and (b) represents a ratio of the number of wafer-defects falling within the first horizontal-strip to the total number of wafer-defects falling within the wafer-map.

19. The method of Claim 18, further comprising wrapping the first set horizontal-defect-percentages to obtain a second set of horizontal-defect-percentages corresponding to a second set of horizontal wafer-strips, the second set of horizontal wafer-strips corresponding to a wrapped version of the first set of horizontal wafer-strips.

20. The method of Claim 18, further comprising the steps of:

determining a first set of vertical wafer-strips (vertical-strips) of the wafer-map; and

computing a first set of vertical-defect-percentages, wherein a first vertical-defect-percentage of the first set of vertical-defect-percentages is (a) associated with a first vertical-strip of the first set of vertical-strips and (b) represents a ratio of the number of

wafer-defects falling within the first vertical-strip to the total number of wafer-defects falling within the wafer-map.

21. The method of Claim 20, further comprising wrapping the first set vertical-defect-percentages to obtain a second set of vertical-defect-percentages corresponding to a second set of vertical wafer-strips, the second set of vertical wafer-strips corresponding to a wrapped version of the first set of vertical wafer-strips.

22. The method of Claim 20, further comprising the step of storing the first set of horizontal-defect-percentages and the first set of vertical-defect-percentages in a defect-signature bank.

23. The method of Claim 22, further comprising the step of associating a weighting-factor with the first set of horizontal-defect-percentages and the first set of vertical-defect-percentages and storing the weighting-factor in the defect-signature bank.

24. A method for processing a semiconductor manufacturing results file (results file), comprising the steps of:

determining a plurality of dies within a wafer-map, the wafer-map indicated by the results file, the results file indicating a first set of defect-coordinates associated with a set of wafer-defects falling within the wafer-map;

stacking the plurality of dies resulting in a die-overlay; and

analyzing the die-overlay to detect one or more repeating patterns.

25. The method of Claim 24, wherein the analyzing step comprises a k-nearest-neighbor (k-NN) algorithm to determine the one ore more repeating patterns, and wherein the k-NN algorithm uses a second set of defect-coordinates, the second set of defect-coordinates corresponding to the first set of defect coordinates but modified to use the die-overlay as reference.

26. A method for processing a semiconductor manufacturing results file (results file), comprising the steps of:

determining a plurality of reticle-fields within a wafer-map, the wafer-map indicated by the results file, the results file indicating a set of defect-coordinates associated with a set of wafer-defects falling within the wafer-map;

stacking the plurality of reticle-fields resulting in a reticle-field-overlay; and

analyzing the reticle-field-overlay to detect a repeating pattern.

27. The method of Claim 26, wherein the analyzing step comprises a k-nearest-neighbor (k-NN) algorithm to determine the one ore more repeating patterns, and wherein the k-NN algorithm uses a second set of defect-coordinates, the second set of defect-coordinates corresponding to the first set of defect coordinates but modified to use the reticle-field-overlay as reference.

28. A pattern-bank for use in detecting manufacturing defects on a substrate, comprising:

a defect-signature; and

a defect-source associated with the defect-signature;

wherein the defect-signature indicates a defects-distribution in a region of the substrate, the defects-distribution according to an annular distribution, a radial distribution or a zonal distribution.

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29. A method for processing a semiconductor manufacturing results file (results file), comprising the steps of:

filtering a first results file by defect size, defect classification, defect spectral frequency or defect intensity, the filtering step resulting in a second results file; and

10   storing the second results file for further defect analysis.

30. A method for processing a semiconductor manufacturing results file (results file), comprising the steps of:

computing a set of k-nearest-neighbor distances (k-NN distances) for a set of

15   defect-coordinates, the set of defect-coordinates indicated by the (results file), the set of k-NN distances indicating a first defect-cluster; and

extracting a set of defect-cluster-parameters for the first defect-cluster, the set of defect-cluster-parameters comprising defect-cluster length, defect-cluster width, defect-cluster area, defect-cluster perimeter, defect-cluster centroid, radius of defect-cluster

20   curvature, angle of defect-cluster major axis, or distance of defect-cluster to nearest scratch centroid.

31. The method of Claim 30, wherein the extracting step comprises determining an envelope around the defect-cluster.

32. The method of Claim 30, further comprising the step of matching the set of defect-cluster-parameters against a defect-signature bank.

33. A method for processing a semiconductor manufacturing results file (results file), comprising the steps of:

generating a set of defect-coordinates, the set of defects-coordinates indicating a defects-distribution; and

extracting a set of parameters (extracted-parameters) from the set of defect-coordinates, the extracted-parameters comprising an annular defects-distribution, a radial defects-distribution or a zonal defects-distribution.

34. The method of Claim 33, wherein the generating step is performed manually using a graphical user interface (GUI) for indicating the set of defect-coordinates.